ifm electronic

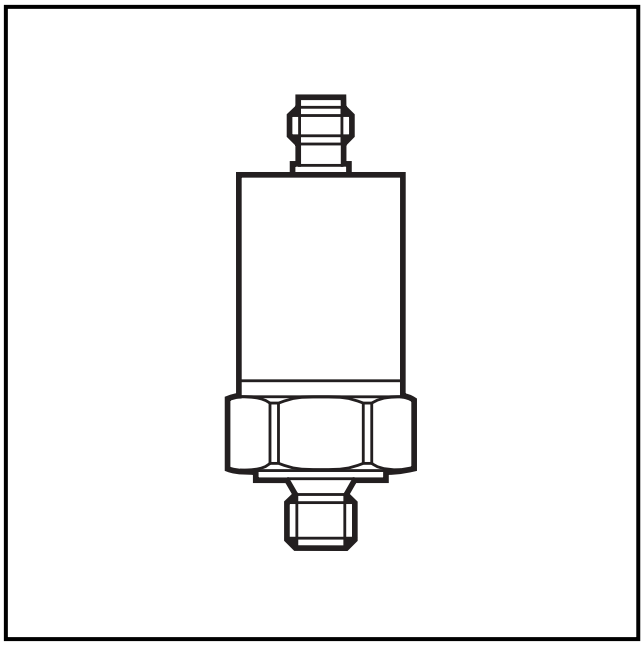
CE

Operating instructions

efector500®

Electronic pressure sensor

PP753X



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704540/00 12/2008

Safety instructions

Please read the product description prior to installing the unit. Please check that the product is suitable for your application without any restrictions.

If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.

Please check in all applications that the product materials (see Technical data) are compatible with the media to be measured.

For gaseous media the application is limited to max. 25 bar.

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1 Function and features

The pressure sensor detects the system pressure and generates output signals according to the set output configuration.

Applications :
Due to its robust design it is specially suitable for mobile use.
Type of pressure: relative pressure

Order no.		Measuring range	Permissible overl. pressure	Bursting pressure
PP7530	bar	0 ... 400	600	1 000
	PSI	0 ... 5 800	8 700	14 500
	MPa	0 ... 40	60	100
PP7531	bar	0 ... 250	400	850
	PSI	0 ... 3 625	5 800	12 300
	MPa	0 ... 25	40	85
PP7532	bar	0 ... 100	300	650
	PSI	0 ... 1450	4 350	9 400
	MPa	0 ... 10	30	65
PP7533	bar	0 ... 25	100	350
	PSI	0 ... 363	1 450	5 075
	MPa	0 ... 2,5	10	35
PP7534	bar	0 ... 10	50	150
	PSI	0 ... 145	725	2 000
	kPa	0 ... 1 000	5 000 (5 MPa)	15 000 (15 MPa)

Avoid static and dynamic overpressure exceeding the given overload pressure.
For gaseous media the application is limited to max. 25 bar.
Even if the bursting pressure is exceeded only for a short time the unit can be destroyed (danger of injuries)!

Sensor with Teach function (factory setting) 2

Factory default values

1 Teach input	for setting to the desired pressure value (pin 2)
1 switching output	semiconductor output, p-switching (pin 4)
Switching function	normally open (normally closed selectable)
Switch point (SP)	25% of value of measuring range; (is set to new value by Teach function)
Hysteresis	2% of value of measuring range
Delay time	0 s
Damping	0.06 s

Installation

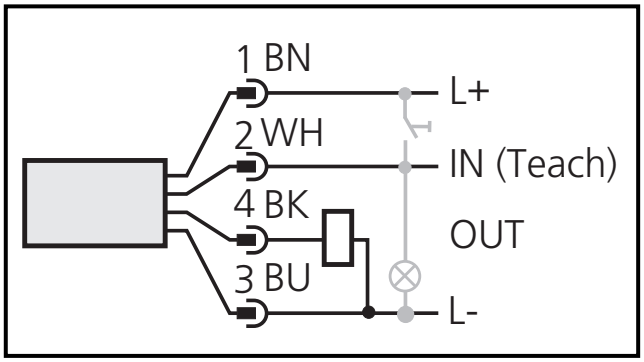
Before mounting and removing the sensor, make sure that no pressure is applied to the system .

Screw the sensor into a G¼ process connection. Tightening torque recommended 25 Nm (max. 50 Nm).

Electrical connection

The unit must only be connected by an electrician.
The national and international regulations for the installation of electrical equipment must be observed.
Voltage supply to EN50178, SELV, PELV.
Disconnect power before connecting the unit.

Wiring:



Core colours of ifm sockets:
1 = BN (brown),
2 = WH (white),
3 = BU (blue),
4 = BK (black).

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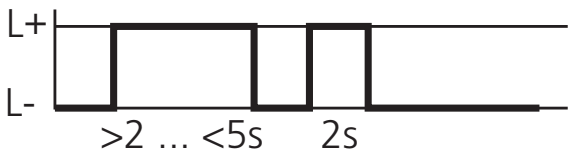
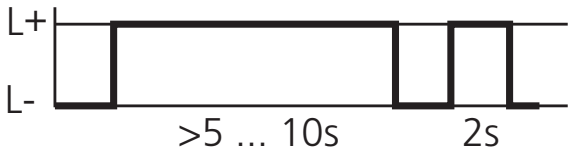
2 Switch point Teaching

Set the requested pressure and keep it constant.	
	Apply the **operating voltage** ($+U_B$) to **pin 2 (min. >2 s, max. <5 s).*** After teaching the sensor supplies a signal at pin 2 for 2 s (= confirmation of successfull setting).**

Change output function:

(normally open → normally closed or normally closed → normally open)

	Apply the **operating voltage** ($+U_B$) to **pin 2 (min. >5 s, max. 10 s).*** After setting the sensor supplies a signal at pin 2 for 2 s (= confirmation of successfull setting).**

*by local push-button, remote push-button or plc
**You can evaluate the signal by a PLC, you can also use this signal for a signal lamp (Imax = 250 mA).

Error message:

If the setting was not successful

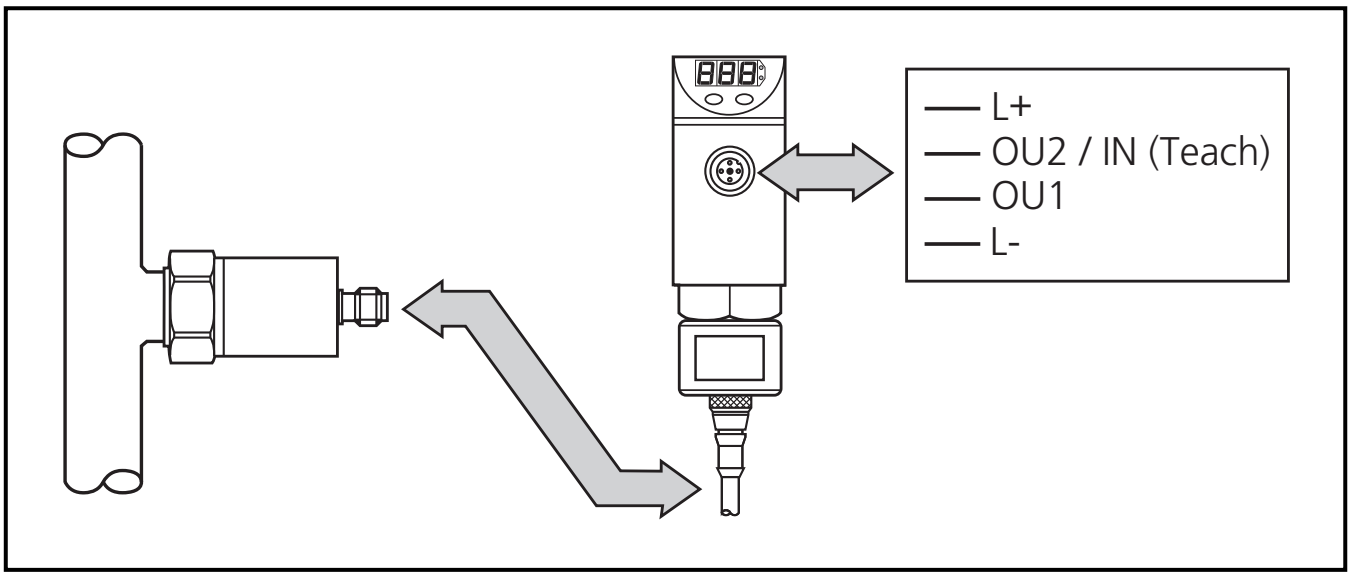
- e.g. too short or too long teaching or
- system pressure outside the measuring range

the signal at pin 2 is not supplied. The previous setting remains effective.

Installation and set-up / Operation

After mounting, wiring and setting check whether the unit operates correctly.

Sensor with display/programming unit PP2000 3



If the sensor is connected to a display / programming unit

- it is supplied with operating voltage by this unit,
- it continuously transfers its data to this unit (measured values, signals transferred to the evaluation electronics and parameter settings).

It provides the following options:

- **Remote display**
  Indication of the current system pressure (in bar, PSI, MPa or kPa) by an LED display.
- **Remote evaluation**
  2 output signals are provided (or 1 signal in the Teach mode) according to the set output configuration.
- **Remote Teaching**
  setting to current system pressure by Teach function
- **Programming / remote programming of the sensor**
  Parameters can be set before the sensor is mounted and set up or during operation.
  For **programming**: → operating instructions of the programming unit.

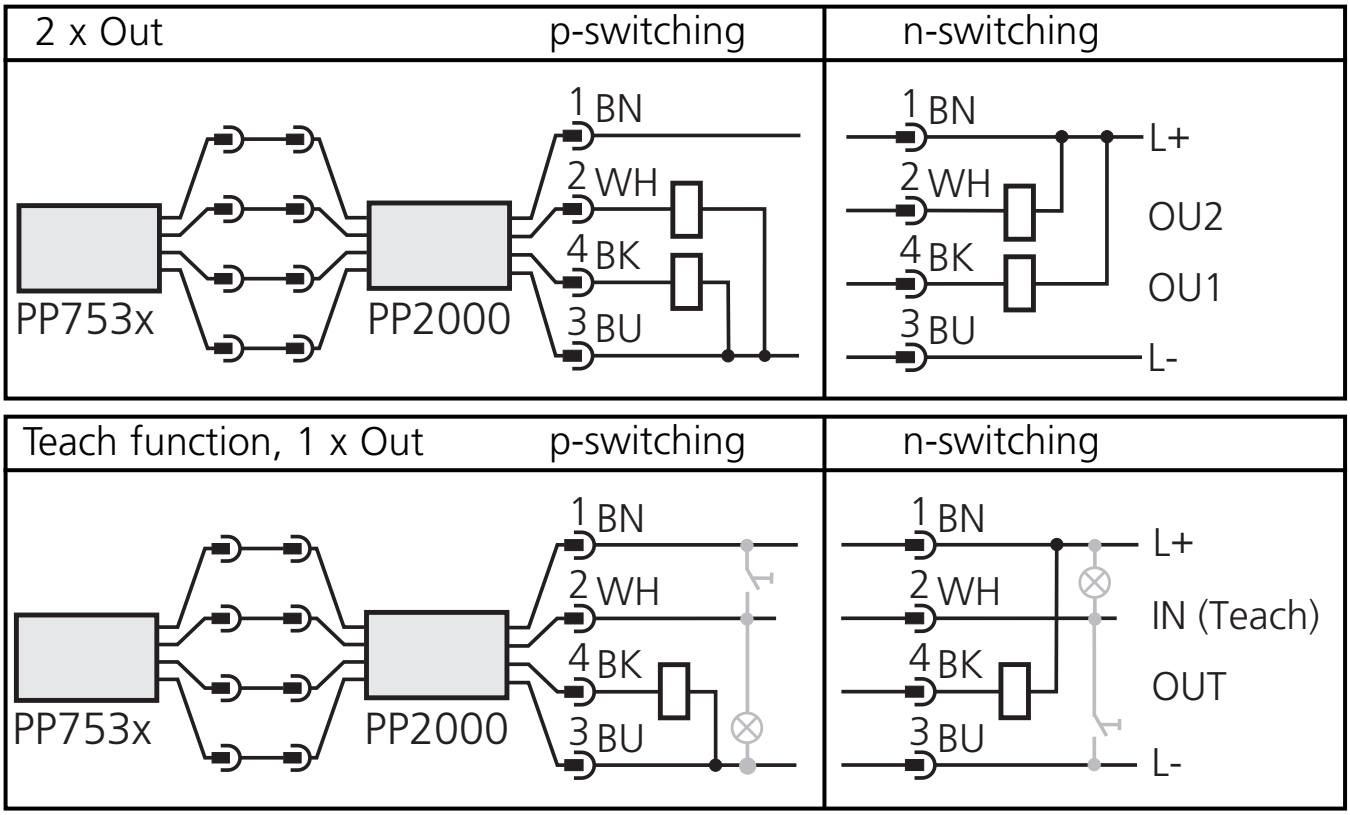
For use of the sensor with PP2000 prior to installation of the sensor:
Use a suitable power supply (operating voltage 11,1 ... 30 V DC).

3 Wiring of PP2000

For hard-wiring of the PP2000: Disconnect power before connecting the unit.

For mobile use of the PP2000 after installation of the sensor: Connect PP2000, sensor and plant via the plug and socket connections only!

Do not disconnect these connections while live.



Teach signal and acknowledgement signal with pnp operation = $+U_B$
Teach signal and acknowledgement signal with npn operation = $-U_B$
Core colours of ifm sockets:
1 = BN (brown), 2 = WH (white), 3 = BU (blue), 4 = BK (black)

Faults displayed during operation:

OL	overload = (above measuring range of the sensor)
UL	underload = (below measuring range of the sensor)
SC 1 SC2	(flashing) = short-circuit in switching output 1/ 2; the respective output is switched off.

Freely configured sensor with 2 switching outputs 4

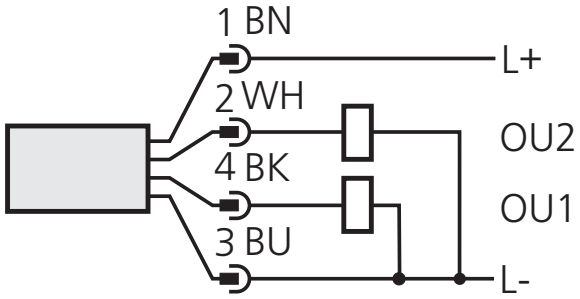
Set the following parameters:
- Switch-on points and switch-off points (**SP1**, **rP1, SP2**, **rP2**)
- Switching function of the outputs (**OU1**, **OU2**)

	output 1	**output 2**
Switching function (can be selected for each output separately)	hysteresis function / N.O. (**Hno**)	
	hysteresis function / N.C. (**Hnc**)	
	window function / N.O. (**Fno**)	
	window function / N.C. (**Fnc**)	

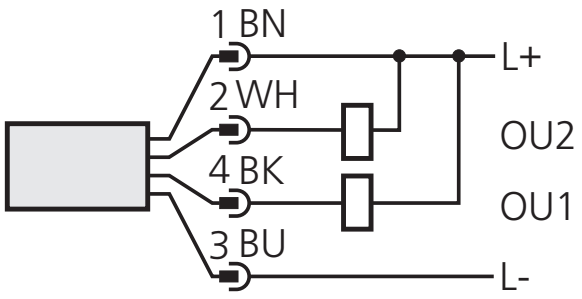
Additionally you can set:
- Delay time and damping for the switching outputs (**dS1**, **dr1, dS2, dr2, dAP**)
- p-switching or n-switching (**P-n**)

⚠ Observe the instructions for installation and electrical connection (page 21).
Connect the unit according to the configuration:

2 x p-switching



2 x n-switching



Core colours of ifm sockets:
1 = BN (brown), 2 = WH (white), 3 = BU (blue), 4 = BK (black)

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⚠ After mounting, wiring and setting check whether the unit operates correctly.

5 Freely configured sensor with Teach function

Set the following parameters:

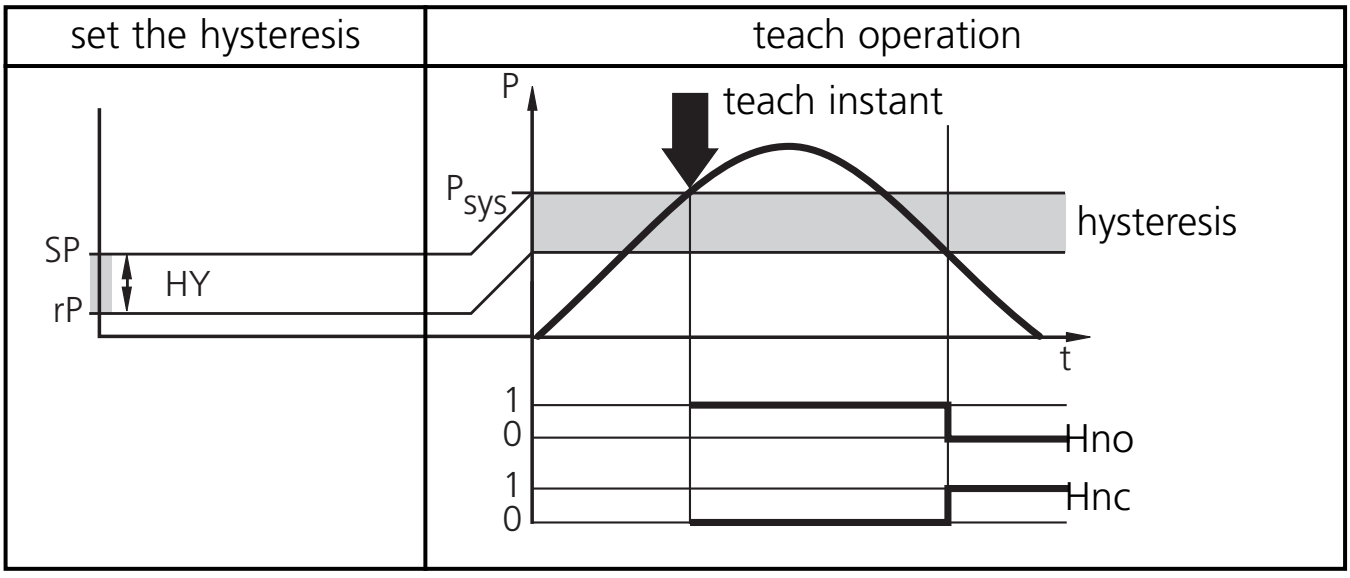
- hysteresis / width of the window (**SP1**, **rP1)**
- **OU2** = **tch** (pin 2 configured as teach input)
- Switching function for output 1 (**OU1**)

hysteresis function / N.O. (**Hno**)
hysteresis function / N.C. (**Hnc**)
window function / N.O. (**Fno**)
window function / N.C. (**Fnc**)

Additionally you can set:

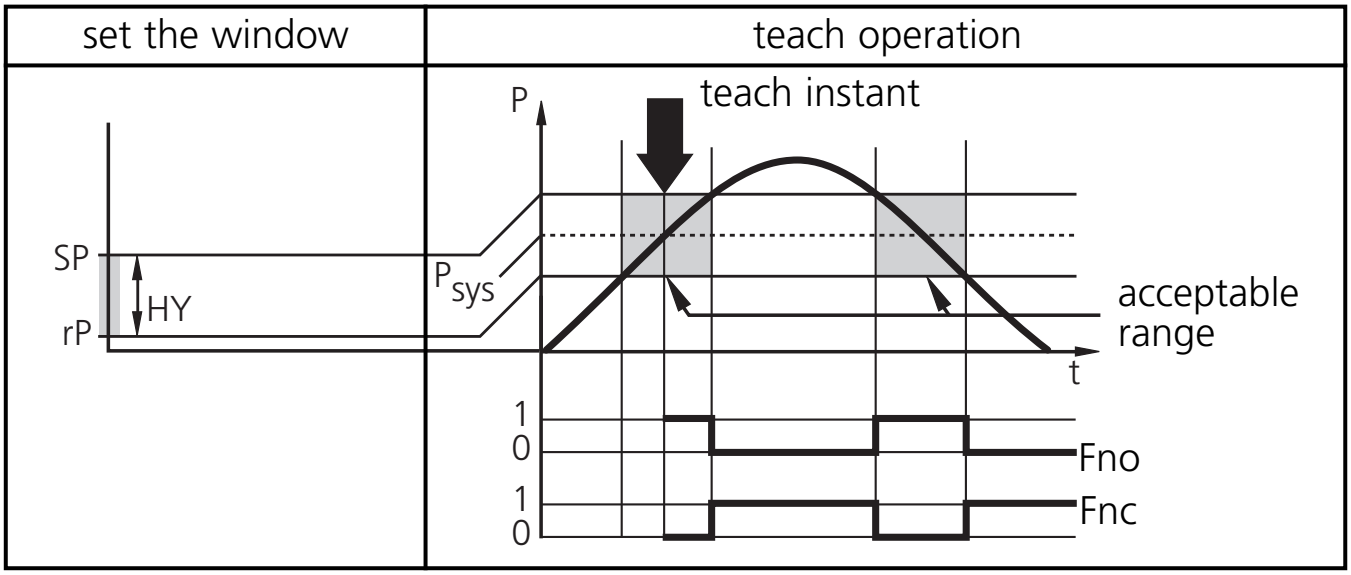
- Delay time and damping for the switching outputs (**dS1**, **dr1, dAP**)
- p-switching or n-switching (**P-n**)

When using the **hysteresis function** (**Hno** or **Hnc**) set the hysteresis by the difference between SP1 and rP1.
During the teach operation the switch-on point is set to the current system pressure (P_{sys}). The hysteresis remains constant.

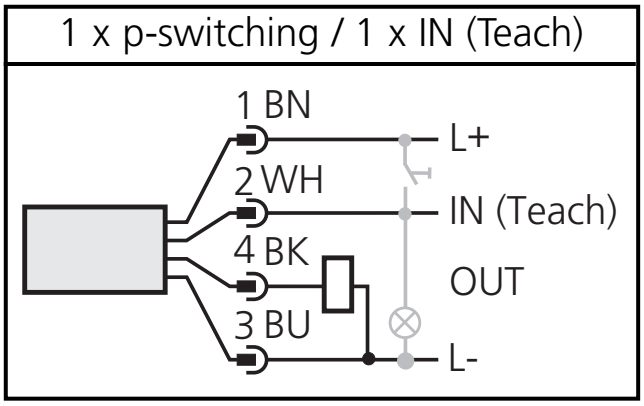


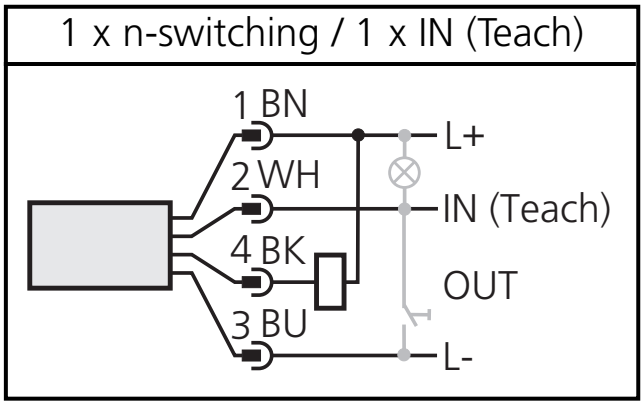
If the **hysteresis is greater than allowed for the switch-on point** (switch-off point would be below the measuring range), the **teach operation is cancelled** (the sensor provides an error signal, → page 22). Reduce the difference between SP1 and rP1 and start the teach operation again.

When working with the **window function** (**Fno** or **Fnc**) set the width of the window by the difference between SP1 and rP1.
During the teach operation the window is set so that the current system pressure (P_{sys}) is **in the middle of the window**.



Observe the instructions for installation and electrical connection (page 21).
Connect the unit according to the configuration:





Teach signal and acknowledgement signal with pnp operation = $+U_B$
Teach signal and acknowledgement signal with npn operation = $-U_B$
Core colours of ifm sockets:
1 = BN (brown), 2 = WH (white), 3 = BU (blue), 4 = BK (black)

After mounting, wiring and setting check whether the unit operates correctly.

Explanation of the teach operation → page 22.
Explanation of the hysteresis and window functions → page 32.

6 Technical information / Functioning / Parameters

Menu items / Adjustable parameters
(when connected to programming unit)

SP1 SP2	**Switch-on point 1 / 2** Upper limit value at which the output changes its switching status. • setting range: 1 ... 100% of the value of the measuring range • indicated in the set unit (bar, PSI, MPa or kPa)
rP1 rP2	**Switch-off point 1 / 2** Lower limit value at which the output changes its switching status. • setting range: 0.5 ... 99.5% of the value of the measuring range • indicated in the set unit (bar, PSI, MPa or kPa) rPx is always lower than SPx. The unit does not accept values for rPx which are higher than SPx. Changing the switch-on point also changes the switch-off point (the distance between SPx and rPx remains constant). If the distance is higher than the new switch point, it is automatically reduced (rPx is set to the minimum setting value).
OU1	**Configuration of pin 4 (output 1 / communication interface)** 5 settings can be selected: - **Hno** = hysteresis / normally open - **Hnc** = hysteresis / normally closed - **Fno** = window function / normally open - **Fnc** = window function / normally closed - **EPS** = The sensor transfers its data to the programming and display unit via pin 4; the settings for SP1 and rP1 are not effective.
OU2	**Configuration of pin 2 (output 2 / Teach input)** 5 settings can be selected: - **Hno** = hysteresis / normally open - **Hnc** = hysteresis / normally closed - **Fno** = window function / normally open - **Fnc** = window function / normally closed - **tch** = pin 2 is the input for the Teach signal; the settings for SP2 and rP2 are not effective.

For the functioning of the connector pins 2 and 4 → page 31

Sto Snd	**Menu items for actions of the PP2000** Sto = store: stores parameters Snd = send: transfers parameters to the sensor See operating instructions of the programming/display unit PP2000.

EF	**Enhanced functions** This menu item contains a submenu with additional parameters. You can access these parameters by pressing the SET button briefly.

HI LO	**Min-Max memory for system pressure** • HI: displays the highest measured pressure • LO: displays the lowest measured pressure Erase the memory: - Press the "Mode/Enter" button until **HI** or **LO** is displayed. - Press the "Set" button and keep it pressed until "**- - -**" is displayed. - Then press the "Mode/Enter" button briefly.
COF	**Calibration offset** The internal measured value (operating value of the sensor) is offset against the real measured value. • setting range: -5 ... +5% of the value of the measuring range
CAr	**Calibration reset** Resets the calibration set by COF. - Press the "Mode/Enter" button until **CAr** is displayed. - Press the "Set" button and keep it pressed until "**- - -**" is displayed. - Then press the "Mode/Enter" button briefly.
dS1 dS2 dr1 dr2	**Delay time for the switching outputs** dSx = switch-on delay; drx = switch-off delay The output does not immediately change its switching status when the switching condition is met but when the delay time has elapsed. If the switching condition is no longer met when the delay time has elapsed, the switching state of the output does not change. • setting range: 0 / 0.10 ... 50 s in steps of 0.1 s (0 = delay time is not active) • indicated in seconds
P-n	**Switching characteristics of the outputs** 2 options can be selected: - **PnP** = positive switching - **nPn** = negative switching This setting applies to both switching outputs.

dAP	**Damping for the switching outputs** Pressure peaks of short duration or high frequency can be filtered out. dAP-value = response time between pressure change and change of the switching status in seconds. • setting range: 0 / 0.01... 4 s in steps of 0.01 s (0 = dAP is not active) Correlation between switching frequency and dAP: $f_{max} = \frac{1}{2 \times dAP}$
di S	**Setting of the display of PP2000** 9 options can be selected: **d1** = update of the measured value every 50 ms **d2** = update of the measured value every 200 ms **d3** = update of the measured value every 600 ms The update interval only refers to the display. It has no effect on the outputs. **ph** = display of the measured peak value remains for a short time (**p**eak **h**old) **rd1**, **rd2, rd3, rph** = display as d1, d2, d3, Ph; rotated 180° **OFF** = In the Run mode the display of the measured value is deactivated. If one of the buttons is pressed, the current measured value is displayed for 15 s. If the Mode/Enter button is pressed once again, the Display mode is activated.
Uni	**Display unit for PP2000** The measured values and values for SPx/rPx can be indicated in the following units: **bAr** (= bar), **PSI**, **PA** (= MPa or kPa) For units with measuring range > 999 PSI 1/10 of the PSI value is displayed. The displayed value must be multiplied by factor 10. Example: **displayed value = 15**; **real value** = 15 * 10 = **150 PSI** Labels for the different display units and correction factors are enclosed with the PP2000 display and programming unit. You can stick the respective label on the unit or fill in the blank label. Select the display unit before setting the switch points (SPx, rPx). This avoids rounding errors generated internally during the conversion of the units and enables exact setting of the values. Setting at the factory : **Uni = bAr**.

Functioning of the connector pins 2 and 4

The **functions of the connector pins 2 and 4 are variable** and can be set by means of a programming unit.

- **Pin 2** = Teach input or switching output (can be set by menu command OU2; → page 28).
- **Pin 4** = switching output or communication interface (can be set by menu command OU1 → page 28).

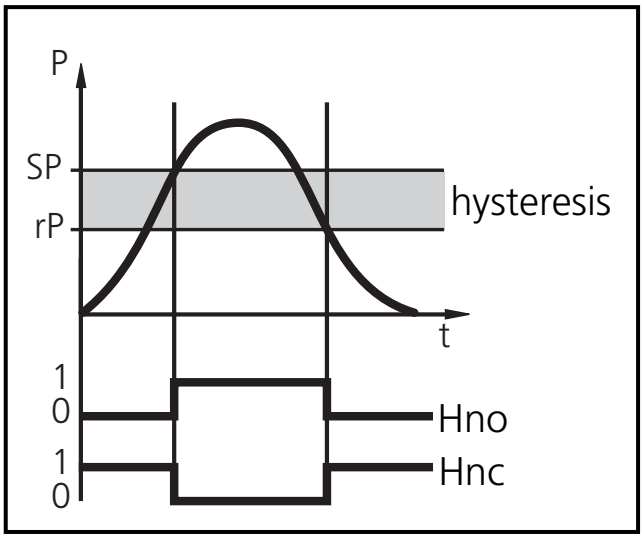
Pin 2	
Setting	Function
OU2 = **tch** (when delivered)	Pin 2 is **Teach input**. A Teach signal at pin 2 defines the current measured value as switching threshold and sets pin 4 as switching output.
OU2 = **Hno**, **Hnc**, **Fno** or **Fnc**	Pin 2 is **switching output**. Switch-on and switch-off points are programmed. The Teach function is deactivated.

Pin 4	
Setting	Function
OU1 = **EPS***	Pin 4 is **communication interface**. The sensor expects an EPS protocol of a programming / display unit. The switching function is not active.
	Pin 4 **automatically** becomes the switching output when the sensor receives a valid Teach signal.
OU1 = **Hno**, **Hnc**, **Fno** or **Fnc** (Hno when delivered)	Pin 4 is **switching output**. Switch-on and switch-off points are programmed.
	When the sensor is connected to a programming/display unit pin 4 becomes communication interface (transfers measurement and evaluation signals, receives programming commands). When the programming/display unit is disconnected, pin 4 **automatically** becomes the switching output again.

* This setting should be selected when the programming/display unit is permanently connected to the sensor.

6 Hysteresis:

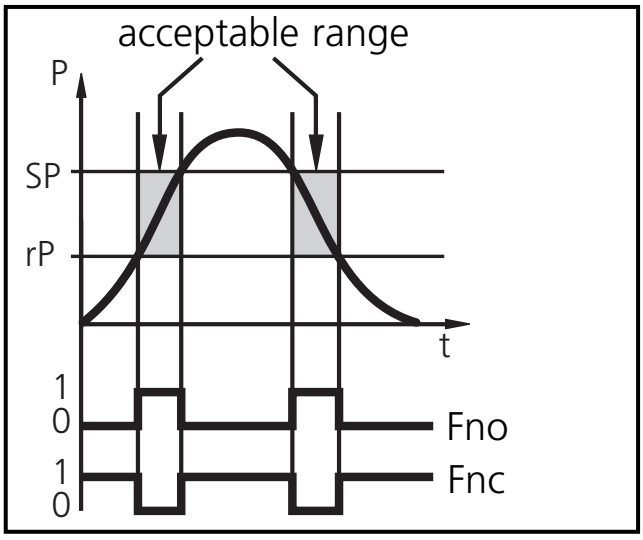
The hysteresis keeps the switching state of the output stable if the system pressure varies about the preset value. When the system pressure is rising, the output switches when the switch-on point has been reached (SPx); when the system pressure is falling again, the output switches back when the switch-off point (rPx) has been reached.



The hysteresis can be set: First the switch-on point is set, then the switch-off point with the requested difference.

Window function:

The window function enables the monitoring of a defined acceptable range. When the system pressure varies between the switch-on point (Sx1) and the switch-off point (rPx), the output is switched (window function / NO) or not switched (window function / NC).

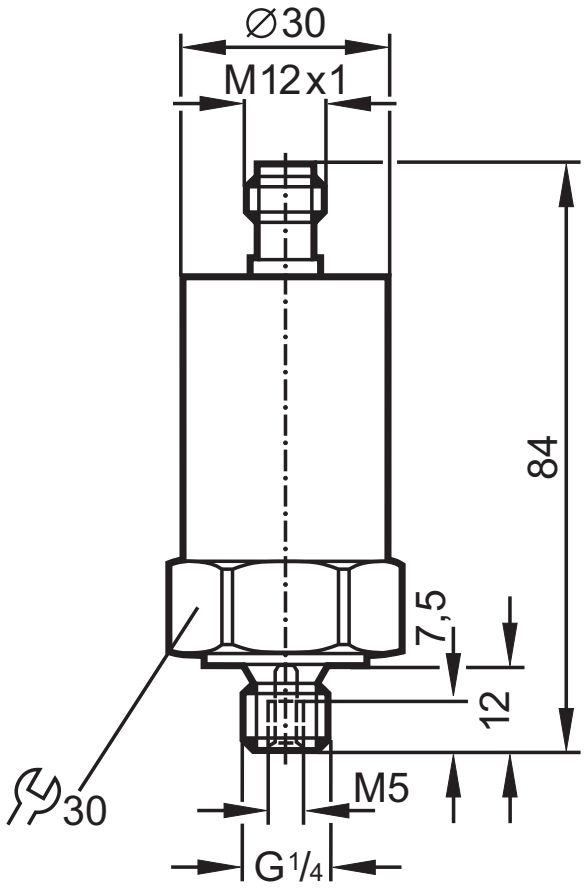


The width of the window can be set by means of the difference between SPx and rPx. SPx = upper value, rPx = lower value.

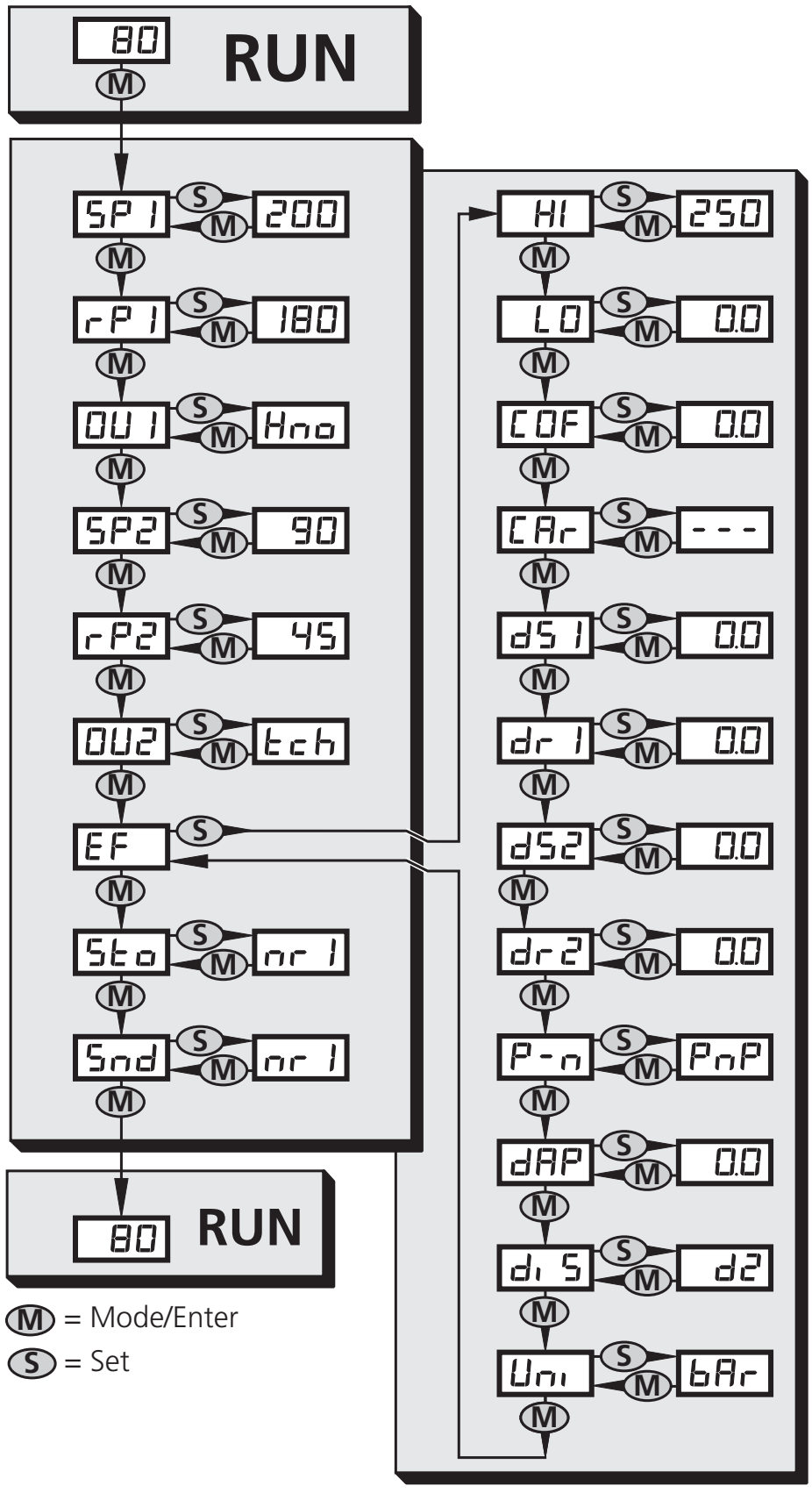
Technical data

Operating voltage [V]	9.6 ... 30 DC
Operating voltage for PP2000 with sensor PP753x [V]	min. 11.1 DC
Current rating [mA]	2 x 250
short-circuit protection, reverse polarity protection / overload protection	
Voltage drop [V]	< 2
Current consumption [mA]	< 45
Accuracy / deviations (in% of the span)	
- switch point	< ± 1.5
- characteristics deviation	< ± 0.25 (BFSL) / < ± 0.5 (LS)
- linearity	< ± 0.5
- hysteresis	< ± 0.1
- repeatability (with temperature fluctuations < 10K)	< ± 0.1
Long-time stability (in% of the span per year)	< ± 0.1
Temperature coefficients (TEMPCO) in the compensated temperature range 0 ... +80°C (in% of the span per 10 K)	
- greatest TEMPCO of the zero point / of the span	< ± 0.2 / < ± 0.3
Power-on delay time [s]	0,3
Min. response time [ms]	3 (if dAP = 0); default: dAP = 0.06s
Switching frequency [Hz]	170 ... 0.125
Materials (wetted parts)	stainless steel (303S22); ceramics; FPM (Viton)
Housing material	stainless steel (304S15); FPM (Viton); PEI
Protection	IP 68 (7 days / 1m water depth / 0.1 bar) IP69K (DIN 40050 / 9)
Protection rating	III (SELV; PELV)
Insulation resistance [MΩ]	> 100 (500 V DC)
Shock resistance [g]	1000 (DIN/IEC 60068-2-27 DIN/IEC 60068-2-29)
Vibration resistance [g]	20 (DIN / IEC 68-2-6, 10 - 2000 Hz)
Switching cycles min.	100 million
Operating temperature [°C]	-40 ... +90
Medium temperaturer [°C]	-25 ... +90 (-40 ... +90 upon request)
Storage temperature [°C]	-40 ... +100
EMC	
radiation of interference according to the road vehicle guideline 95/54/EC	
noise immunity according to the road vehicle guideline 95 /54/EC appendix IX	
HF radiated	150V/m
pulse resistance according to ISO 7637	
supply according to ISO 7637-2 (pulses 1a, 1b, 2, 3a, 3b, 4, 6, 7)	
signal cables according to ISO 7637-3 (pulses a and b)	
noise immunity according to EN 61000-6-2	
EN 61000-4-2 ESD:	8 / 15 KV
EN 61000-4-3 HF radiated:	100 V/m
EN 61000-4-4 Burst:	2 KV
EN 61000-4-6 HF conducted:	10 V

Maßzeichnung
Scale drawing
Dimensions



Programmier-Menü (zugänglich nur mit Programmiergerät)	**Programming menu** (only when connected to programming unit)	**Menu** (seulement si raccordé à une unité de programmation)



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Technische Änderungen behalten wir uns ohne vorherige Ankündigung vor. Papier chlorfrei gebleicht

Eingestellte Parameter-Werte / Set parameter values / Valeurs de paramètre réglées

	DEFAULT			DEFAULT	
OU1	Hno		COF	0.0	
OU2	tch		dS1	0.0	
SP1	25%		dr1	0.0	
rP1	23%		dS2	0.0	
SP2	75%		dr2	0.0	
rP2	73%		P-n	PnP	
			dAP	0,06	
			di5	d2	
			Uni	bAr	